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COOPERATION AT DIFFERENT STAGES OF INNOVATION PROCESS: THE EFFECT ON COMPANY'S PERFORMANCE

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Abstract: Existing research has highlighted the importance of cooperation in innovation. However, there still is insufficient understanding of how cooperation is linked to the stages of innovation process. Current working paper aims to answer the following research questions: (1) At what stages of innovation process do the companies cooperate more: when they create or commercialize innovation? (2) Does the cooperation in innovation depend on the relational learning capability? (3) On what stage does cooperation stronger influence the company's performance? We answer these questions by examining innovation cooperation on example of a sample of 157 Russian firms. The finding highlight the role of relational learning and indicate distinctive characteristics of cooperation at the early and the late innovation process stages.

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1. Introduction

Cooperation in innovation helps to harness the value from the complex nature of innovation process (Garud, Tuertscher &Van de Ven, 2013) and brings numerous benefits as, for example, the reduction of the amount of time and workload (and, consequently, costs). Swink (2006) has proven that cooperation can improve innovation development cycle time from 15 to 25% or reduce new product introduction time by 15% and non-value-added work up to 60%. Existing research has demonstrated that cooperation with external sources is positively related to the innovative results and company's performance (Kohtamaki, Partanen &Moller, 2013; Mazzola, Bruccoleri &Perrone, 2012). The research shows that cooperation in innovation facilitates the process of knowledge transfer within and beyond one organization and enables joint resource use (Becker, Dietz, 2004; Nieto, & Santamaria, 2007), as well as that companies should organize knowledge sharing from the communities of users, customers and developers for innovativeness improvement (Foss, Laursen, &Pedersen, 2011; Colombo, Piva, &Rossi-Lamastra, 2013).

External cooperation in innovation implies an active participation of different actors in joint research projects with other organizations or individuals, which allow companies to combine resources, knowledge and ability to achieve common goals, even when parties do not receive immediate commercial benefit (Tether, 2002; Okamuro, 2007; Tuusjarvi, Moller, 2009). The increasing body of research studies innovation as a process, involving external parties. External innovation is associated with the concepts of cooperation in innovation, collaborative innovation, open innovation, innovation co-creation, innovation ecosystem, innovation communities and innovation network concept (e.g., Öberg &Shih, 2014; Ostendorf, Mouzas &Chakrabarti, 2014; Chesbrough, 2012; Adner &Kapoor, 2010). These concepts differ in defining the level of openness in interaction with external parties.

Current paper aims to contribute to study innovation as co-created within networks of diverse actors by, firstly, investigating the relationship between cooperation at different stages and performance, and, secondly, analyzing role that relational learning capability in in these settings. More specifically, we investigate the influence of cooperation during the early and late stages of innovation development on company's performance as well as to understand at what stages do the companies cooperate more. Another question that we are going to address is whether the cooperation in innovation depends on the relational learning capability.

Innovation can be seen as a process with different stages, those stages have been extensively studied, both within and outside the context of cooperation (Cooper, 1990; Menguc, Auh, &Yannopoulos, 2014, McNally, Akdeniz, &Calantone, 2011). Existing research distinguishes between two main stages of innovation process - the early stage, referring to innovation development or creation, and the late stage, or the production and commercialization of innovation (Hempelmann &Engelen, 2014; Laursen &Salter, 2014). However, there still has been little attention paid to the effect that cooperation on the stages of innovation development and commercialization has on the preliminary results of innovation activities and the company's performance.

Thus, in our approach we firstly follow existing research in applying multi-stage approach towards cooperation in innovation process from the narrative perspective with the accent on relational aspects (Oberg, Shih, 2014, Ostendorf, Mouzas & Chakrabarti, 2014, Hempelmann &Engelen, 2014, Garud et al., 2014). However, innovation process cannot be considered without taking into account different characteristics and goals of its stages that define different need for and outcomes from cooperation at different stages.

Moreover, we focus at the relational aspect of innovation and consider the core role of relational learning. Co-evolutionary and relational nature of innovation process implicates multiple levels of analysis and involvement of diversity of actors (Garud, Tuertscher & Van de Ven, 2013). Cooperation in innovation provides opportunity to establish beneficial transfer of resources and combine competences and capabilities to achieve synergetic effect by forming "relations with others that complement their own activities, skills and resources" (Wilkinson et al., 2003). The value obtained from cooperation in innovation depends on the company's capability to engage partners into relationships, managing them and achieving common results. Relational capability reflects company's tendency for engaging into joint activities and exploiting the value from these relationships on a permanent basis.

The structure of the paper is the following: at first, we will review some relevant literature regarding the constructs of our interests and interactions between them in order to explain our research framework. Then we will explain the applied methodology and present our key preliminary findings, followed by the brief discussion of the obtained results.

2. Theoretical Background and Hypotheses

2.1 The stages of innovation process

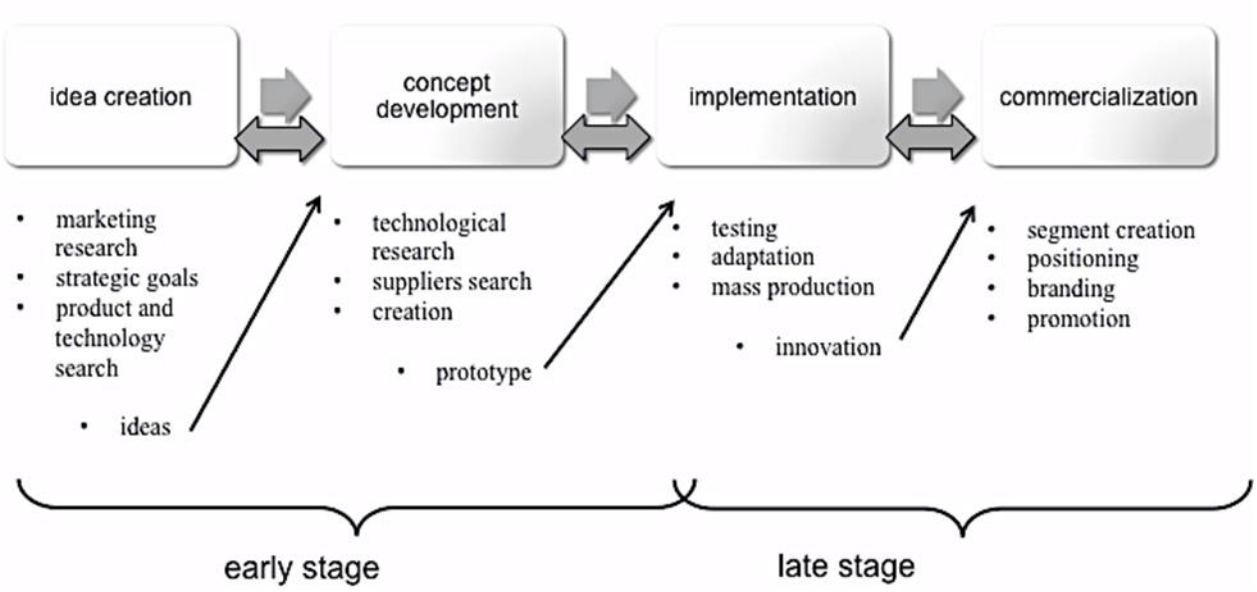
There are different approaches towards defining innovation. Some scholars consider it to be an event in a time, or an outcome of certain processes, while the other stress the necessity to look at it as a process with different stages. In the latter case, innovation can be defined as the process of searching, developing, improving, adapting and commercializing new products, processes, organizational structures and procedures, which is characterized by high levels of uncertainty, risk, continuous research, testing and experimentation (Dosi, 1998; Jorde &Teece, 1990). Innovation also can be seen as a cumulative result of collaborative innovative process between company and its environment, or between different actors within and beyond one organization (Mention, 2011), as it is described in the simultaneous model of the nature of innovation (Jorde &Teece, 1990). This approach emphasizes the relationships and feedback mechanisms with various market actors, underlining the significance of both internal and external cooperation in innovation (Jorde &Teece, 1990; Teece, 1992; Erbes, Robert, &Yoguel, 2010). Minnesota Innovation Research Program (MIRP) considers that innovation process is characterized by repetitive phases, which are defined by processes within the company (use of resources) and external processes (institutional rules, limited resources) (Garud, Tuertscher &Van de Ven, 2013).

In the existing literature we can find definitions of NPD process, commercialization process and innovation process (Zemlickiene &Maditinos, 2012). The most extensive research has been made in the field of NPD, starting with Cooper's Stage-Gate model (Cooper, 1990). Similarly to the innovation process, NPD process usually covers the whole set of activities - from discovery to market launch. However, innovation process has a broader view on innovation as it covers all stages from invention to development and implementation of innovation (Garud et al., 2013). The innovation and commercialization processes are interrelated (Kelm, Narayanan, &Pinches, 1995; Zemlickiene &Maditinos, 2012), meaning that commercialization is a part of innovation process focused more on the application of innovation.

Depending on the characteristics of specific innovation project and the stage it is undergoing, the actual variety of the activities carried out by the focal firm and the need or opportunity for cooperation may be very different. However, to describe the content of innovation process we generalized the results obtained by previous studies (for. ex., Garud et. al. (2013), Zemlickiene &Maditinos (2012), Luchs & Swan (2011)) and distinguished four major phases of innovation processes: idea creation, concept development, implementation and commercialization

(fig. 1).

Figure 1: Stages and phases of innovation process



At first, based on the information obtained by market research and company's goals product and technology search are conducted resulting in the generation of ideas for future innovation. Then the selection process leads to the concept development, which assumes potential search for technology and suppliers, as well as the actual creation of the prototype. This prototype should be tested on the market and adapted to the needs and requirements of consumers before the production can be launched. The product obtained at the end of this phase is ready to be commercialized, implying product launch support, as well as the after-sales services. If innovation process is performed in interaction with customers, is driven by lead-users or is oriented on particular segment the success of innovation commercialization might be higher. In many cases intelligent innovation process implies interaction and overlapping between phases.

Although there is no agreement on the specifics of the innovation process phases, current research (Oberg &Shih, 2014) divides all phases of innovation process into two broad stages connected with innovation development (or creation) and innovation production and commercialization. While comparing different NPD stages approaches, Hempelmann &Engelen (2014) distinguished between the early and the late stages of innovation in line with the innovation creation and commercialization stages from (Laursen &Salter, 2014). In addition, one can find two big streams of research focused on innovation development, design or creation (Menguc et al, 2014) and innovation introduction or commercialization (Markman, Siegel, &Wright, 2008; Boehm &Hogan, 2013). The early stage of innovation process is usually addressed within the concept of R&D, which includes idea generation and concept development phases and sometimes also implementation activities. There are however some variations in what constitutes the later stage of innovation process, associated with the commercialization activities. Depending on the perspective, the concepts of adoption, launch and diffusion of innovation can be attributed to the understanding of the later stage (Aarikka-Stenroos, Sandberg &Lehtimäki, 2014).

For the purposes of our research we include innovation implementation and commercialization phases described above in our understanding of the late stage of innovation development. As there is still a lack in empirical investigations on the exact activities that constitute the innovation development and commercialization stages, we are going to follow the

CIS (2007) approach to explore the activities at different phases of innovation process and check if there are any specific patterns of how firms address different stages.

Based on the classification of the barriers for innovation suggested by Sandberg & Aarikka-Stenroos (2014), we divide them by the stage of innovation process. On the early stage of innovation process companies face the problems connected mostly with their internal characteristics: restrictive mindset, lack of discovery and incubation competences or resources as well as the difficulties with external financing. On the other hand, on the late stage external barriers for innovation start to play a more important role: resistance or lack of support from external stakeholders, restrictive characteristics of the environment or ecosystem or insufficient infrastructure. Commercialization competences from this perspective play big role as well. One might propose that cooperation on the early stage might be determined by company's characteristics. At the same time, cooperation on the later stage is important for a wider range of companies as it allows gaining cumulative effect in market shaping.

The paradoxes of openness and disclosure (Arrow, 1962; Bogers, 2011; Laursen &Salter, 2014) arise when companies define their level of openness in innovation activities. They need to reveal some knowledge to obtain information, but also care to provide a certain level of security from copying the results of their innovation. It becomes even more crucial on the late stage of innovation process when carefully selected results from the innovation research can be easily copied by rivals, bringing all the investments go to waste. During the whole innovation process firms aim to leverage their resources and ensure a proper protection for IPRs resulting from cooperation (Ostendorf, Mouzas & Chakrabarti, 2014).

2.2 The cooperation during the early and late stages of innovation process

Some recent research paid attention to the nature of cooperation at the stages of innovation creation (Füller, Jawecki, &Mühlbacher, 2006; Menguc et al., 2014) and innovation commercialization (Markman et al., 2008), as well as on both of them (Oberg & Shih, 2014). It can be assumed that there will be differences in cooperation on these different stages, as they are driven by different factors and motivations, and might have different performance outcomes. All motives for cooperative innovation can be divided into motives associated with basic and applied research and motives associated with market access and influencing the market structure (Hagedoorn, 1993). We can presume that the first group of motives will mostly influence cooperation in innovation development stage, while the second one will have impact on innovation commercialization stage. Yet, from the current literature one still cannot derive an understanding, on which stage of innovation process would companies mostly cooperate and how would the cooperation on the early stage be related to the cooperation on the late stage of innovation development.

The early stage of innovation usually demands a variety of resources, high knowledge generation ability and information from different sources (Laursen &Salter, 2014). Moreover, it usually requires high level of costs with indefinite expectation on the returns of the investments made. Cooperation at this stage may help companies to overcome these obstacles by dividing costs and risks (Hienerth, Lettl, &Keinz, 2014) and sharing resources and information with the partners. While cooperating during innovation development, companies gain access to information about market (including customer's requirements) and necessary resources, achieve better creativity that boosts their idea generation ability. Furthermore, cooperation at the early stage of innovation development (especially cooperation with customers or users) facilitates the process of later innovation commercialization by increasing its adaptability (Al-Zu'bi &Tsinopoulos, 2012). It provides companies with regular connection to market through the channels of each actor that

serves for better idea selection and answers market needs, increasing the changes for the success in innovation commercialization.

While the creation of innovation usually benefits from the diversity of cooperative partners, a problem with the innovation results sharing and protecting emerges at the stage of the innovation commercialization (Laursen &Salter, 2014). However, the research also shows that the acceptance of innovation by different market agents and the support from the diverse range of stakeholders is essential for the successful commercialization of innovations as it lowers adoption barriers and resistance from consumers (Dell'Era, Frattini &Ghezzi, 2013; Aarikka-Stenroos, Sandberg &Lehtimäki, 2014). Thus, cooperation in innovation commercialization is highly beneficial for all actors (Markman et al., 2008); however, companies might experience a need in changing the network structure when moving from the early to the late stage of innovation process (Aarika-Stenroos, Sandberg, 2012). There might be therefore differences between the stages of innovation process in terms of the structure of partners, style and scope of cooperation, as well as cooperation and overall performance outcomes.

2.3 Hypotheses development

2.3.1. The role of previous relational experience in the cooperation at the early and late stages of innovation process

The reasons for cooperation in innovation processes lie deep within transaction costs theory and dynamic capabilities view. The first one tells us that the choice between internal and external innovation is influenced by the ratio between the costs for transaction and the costs for internal implementation of the activities (Coase, 1960; Williamson, 1985). This ratio depends on the companies capabilities (Jacobides & Winter, 2005) by, firstly, explaining the possibility for in-house innovation (direct innovation capabilities) and, secondly, the costs for external innovation or the costs for relationship establishing and management (relational capability).

Transaction costs perspective implies that cooperation in innovation is limited by the barriers, related to the "small-numbers-bargaining hazards and appropriability concerns" (Pisano, 1990: 153). As all barriers for cooperation in innovation lie within the whole relationship life cycle (Freytag, Clarke, 2002), the first group barriers might be reduced by establishing efficient relationship management routines, e.g. formulation of principles for external actors involvement or of the systematic approach towards relationship management. Second group of barriers can be addressed via the development of the ability to build the relationship on the base of trust and commitment that is also associated with ability to choose partners with common goals and shared values and to build honest relationships. Overall, cognitive barriers in the mind of company's management and employees establish its attitude towards the degree of openness, reflected in its relational capability. At the end, during the decision making process it might all come to the personal beliefs, or the shared values of the company. These shared values constitute firm's behavioral predispositions and proclivities that can be considered as an antecedent of capability (Tainor, Krush, Agnihotri, 2013). And if the company is constantly investing into the learning and development of its relational capability, it tends to cooperate more, thus increasing its level of openness.

We had previously indicated that cooperation during the early stage of innovation process is beneficial as it allows different actors to exchange information and establish knowledge sharing along with joint resource use. However, companies are still facing the problems in deal-making that can be reduced by the development of the relational capability. Moreover, cooperating at the late stage, companies face the problem with the sharing and protecting of innovation results (Laursen &Salter, 2014). To participate in joint activities in innovation commercialization and

overcome arising problems companies need to be sure in their partners, which requires high levels of commitment and trust that comes from previous relationship history (Athaide &Klink, 2009).

It is obvious that the ability to establish cooperative partnerships and to protect achieved innovation results is associated with the company's relational capabilities (Kohtamaki, Partanen &Moller, 2013). Relationship capability is comprised of different components and represents a "set of activities and organizational routines" (Mitrega et al. 2012: 741), aimed to initiate, develop and terminate relationships for the benefit of the company.

We follow Kale & Singh (2007) and believe that learning processes that come from the analysis of previous relationships forms the basis for the development of the relational capability. During the cooperative innovation process companies co-create value together while learning and improving their capabilities (Frow &Payne, 2011), which lead them to greater confidence in establishing cooperative relationships due to the greater relational experience. It has been proven by previous research that company's cooperation experience influences the success of innovation process (Okamuro, 2007), as well as that it also improves company's ability to recognize partners with similar goals and interests, and this similarity facilitates companies in successful innovation cooperation (Oberg & Shih, 2014). Company can learn both from previous positive and negative experience and develop further its relational capabilities. However, if this company does not analyze the process and outcomes of partner relationships, it cannot cumulate the knowledge to improve its relational competency. Therefore, we believe that relational learning capability encourages companies for cooperation and increasing of their relational capability:

> H2a&b. Relational Experience drives further the cooperation in the early (H2a) and late innovation process stage (H2b).

However, in the existing literature there is still a lack of understanding of whether relational experience has the same effect on cooperation during the early and the late innovation process stages. Relational experience might be of even greater importance to the companies that need to adapt to new economic and institutional realities, and develop their strategic responses and rules of the game (Peng, 2003).

2.3.2. Interaction between the cooperation during the early and the late stages of innovation process

Cooperation in innovation is often determined by the type of innovation and the characteristics of the innovator company: more complex or radical innovations, as well as innovation conducted by small companies can rather be associated with a lack of own resources and expertise thus urging for cooperation; incumbent companies might as well need the boost from other actors to enhance their innovative performance. Thus, if company feels the need to joint efforts with other market agents for innovation project on its early stage, it might need to obtain additional support on the later stage as well. We also believe that cooperation at the earlier stages might foster cooperation at the next stages of innovation process due to developed degree of openness or understanding of external opportunities. Moreover, as commercialization brings the main profit from innovation, partners will be more likely to cooperate throughout the whole innovation process:

> H2. The cooperation in the early innovation development stage is related to the cooperation in the late stage.

2.3.3. The effect of cooperation during innovation development and commercialization stage on the results of collaborative innovation and company's performance

It used to be that companies almost never shared their innovation results with other market actors during the early stages of innovation and never during the later stages, as it was essential for their competitiveness (Gassmann, 2006). However, during the last decade situation changed. The market structure had become more complex, applying the need to keep abreast of the changes in needs and requirements and also to stay close to the market during the process of innovation commercialization. For example, cooperation with clients or users during innovation development stage can lead to better product definition, which is connected to performance in terms of market share, sales numbers and profitability (Cooper & Kleinschmidt, 2001). As the value from the innovation can be harnessed only if it's properly commercialized (Teece, 1992), companies find it not only useful but also necessary to cooperate with others in innovation commercialization more and more frequently.

We believe that cooperation at the early and the late stages of innovation process brings companies results that were set as the goals for cooperation, for example, new knowledge, decrease in risks or bigger success in the innovation development (Story, O'Malley &Hart, 2011; Park, Srivastava &Gnyawali, 2014):

H3a&b. The cooperation at the early (H3a) and the late (H3b) stages of innovation process has positive impact on the cooperative innovation results.

These results indicate the intermediate success of both innovation process and cooperation during this process. The research on NPD has paid attention to the impact of the cooperative activities in innovation process on the new product performance (Molina-Castillo, Munuera-Alema &Calantone, 2011). New product performance measures include both preliminary results discussed above along with company's performance. We refer to these results as intermediary as they should be directly related to the overall company's performance:

H4. The cooperative innovation results are positively related to the company's performance

Cooperation in innovation with external sources on both early and late stages of innovation process is related to growth, market value, customer satisfaction, profitability and financial performance (Kelm et al., 1995; Mazzola, Bruccoleri &Perrone, 2012; Herhausen &Schögel, 2013; Kohtamaki et al., 2013). However, there is still a lack of understanding of the differences in impact that cooperation on different (e.g. innovation development and commercialization) stages has on company's performance.

H5a&b. The cooperation during the early (H5a) and the late (H5b) stages of innovation process is related to the company's performance.

3. Methodology

3.1 Data collection

The data was obtained from the semi-structured personal interviews with company's CEOs, CMOs and CTOs. Existing scales were used as the basis of questionnaire. We also conducted the procedure of back-translation and pre-tested scales on a small sample to ensure the correct understanding and viability of the constructs for the Russian market. Based on the obtained feedback the questionnaire was adjusted to ensure proper data collection. The data collection process lasted from November 2009 to March 2010 and resulted in 206 respondents from 157 Russian companies. We approached about 2000 companies and got a 10% response-rate.

Our cross-sectional sample contains 157 innovative firms (206 responses). The sample is determined in order to investigate the phenomenon of innovation creation by Russian firms with

the focus at product innovation. Two criteria were used to build the determined sample of Russian innovative firms: industries and regions with the highest level of innovation activities were selected according to the official statistics. Selection of regions was conducted based on the innovative activity of firms in these regions, according to official Rosstat data for 2009. The firms were selected from 11 out of 83 regions of Russian Federation representing 6 Federal districts (all except Far Eastern Federal district which was excluded from the sample because of its remoteness and inaccessibility).

Our sample consists of innovative companies from sectors with high and medium level of innovativeness (electronics and optics equipment, electronic equipment, rubber and plastic industry, machine building, chemical industry, aviation, IT and telecommunications, metallurgy, and others). 85% of the companies are functioning in production sector and 15% in service; 67% are working in B2B and 33% - in B2C. The sample represents companies with different financial results, strategic orientation, approaches towards innovation and other internal characteristics to ensure greater representativeness.

3.2 Data analysis

3.2.1. Descriptive analysis

Before testing the hypotheses, we provide a short description on the innovative activities of the firms in the study sample. We start our analysis by describing the main factors that influence company's decision to conduct cooperative innovation. At first were studied the barriers and risks of innovative activities and cooperation in innovation. The results indicate that the main barriers of innovativeness are connected to the financial and economic factors (Table 1). The risks of cooperation in innovation are mostly connected with the uncertainty about the partners. These risks are mostly connected to lack of trust or ability to establish secure relationships in the course of innovation. This result highlights a potential role of relational learning that was introduced in the theoretical part of the paper.

Table 1. The negative influence on cooperation in innovation

Barriers for innovativeness	Mean
High innovation costs	3.91
Economic risks	3.85
High interest rates	3.51
Difficult to get loans for inventing them into innovation projects	3.43
Government regulation and standards requirements	3.32
No feedback from consumers concerning new products and services	2.94
No highly qualified personnel	2.93
No enough information on markets and consumers' needs	2.93
No sufficient IT resources	2.88
	2.84

Organizational inflexibility inside the company

Risks from cooperation in innovation	Mean
Informational risks	
Drain of information about the clients	3.11
Drain of production plans	3.04
Copying of the management experience by the partner	2.78
Cooperation risks	
Risk of loosing of the key employees	3.08
Possible changes in the partner's business processes can lead to high risk in case of developing business relationships with the partners	3.03
Risk connected with the contracts that are on the basis of collaboration	2.88
Our partners are not likely to invest in relationships as stated in the contract	2.78
Risk of management of relationships and collaboration	2.64

Russian companies are mostly influenced by other local market actors in their innovation activity, e.g. local competitors and consumers (fig. 2). Competitors (both Russian and foreign competitors in Russian markets) play a very important role in influencing the innovation processes.

Figure 2. The actors motivating the innovativeness of Russian companies

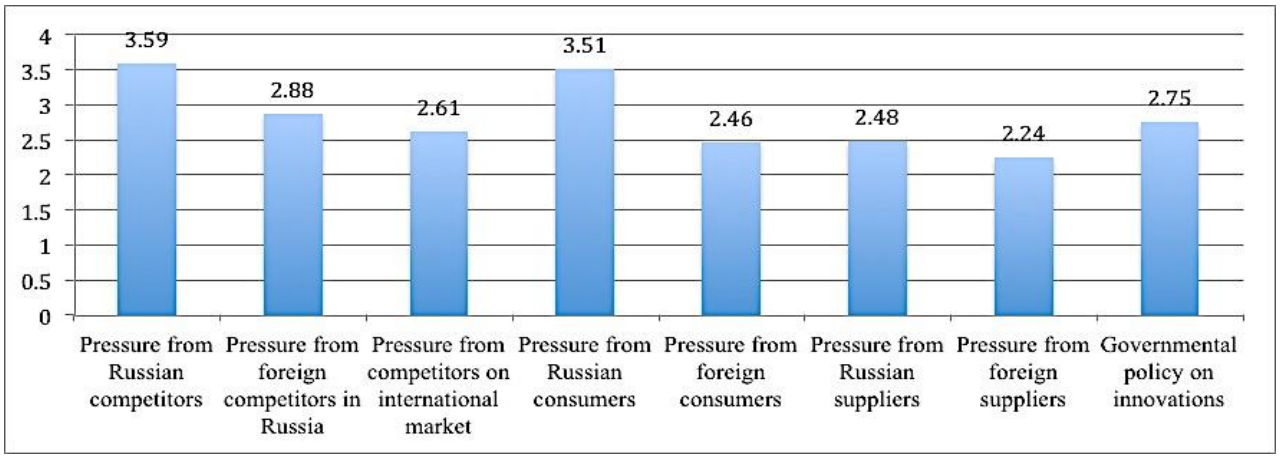
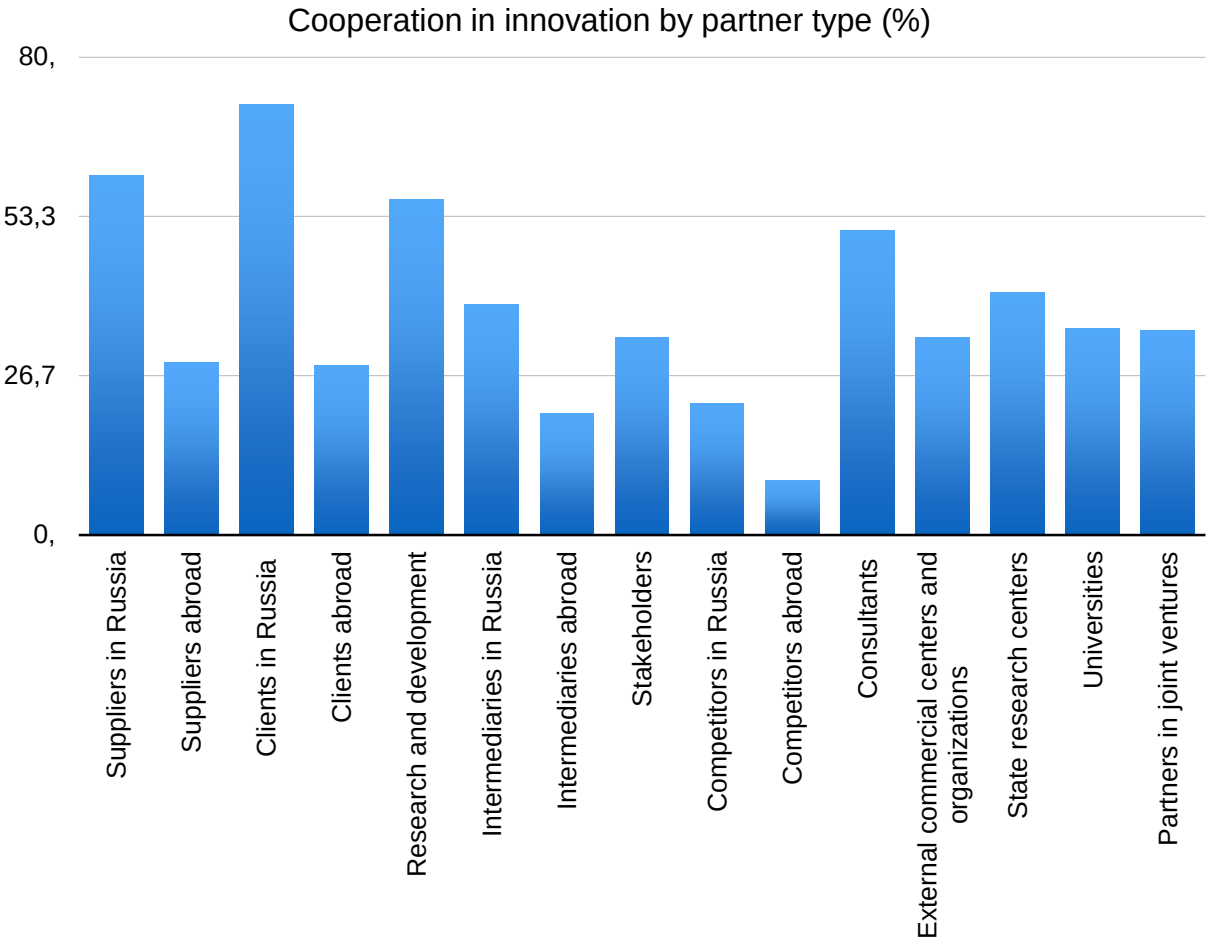


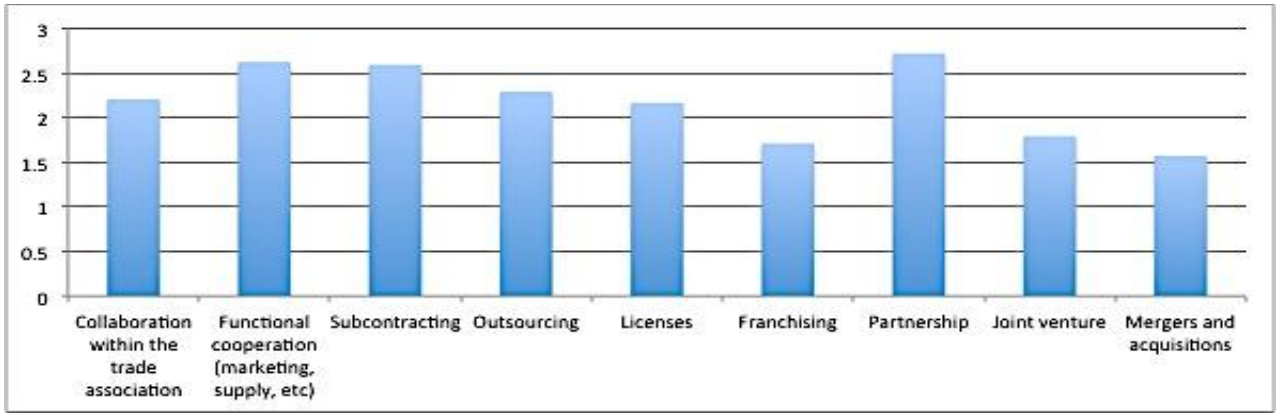
Figure 3 represents the distribution of the types of external parties, involved in the innovation processes by the sample firms. The leading roles in collaborating in the area of innovation play clients in Russia, domestic suppliers, research and development organizations and external consultants. The least importance is associated with the foreign market actors, including customers, suppliers, intermediaries and competitors from abroad. These results illustrate a rather domestic orientation in innovation strategy of the sample firms.

Figure 3. The distribution of the external actors involved into innovation process



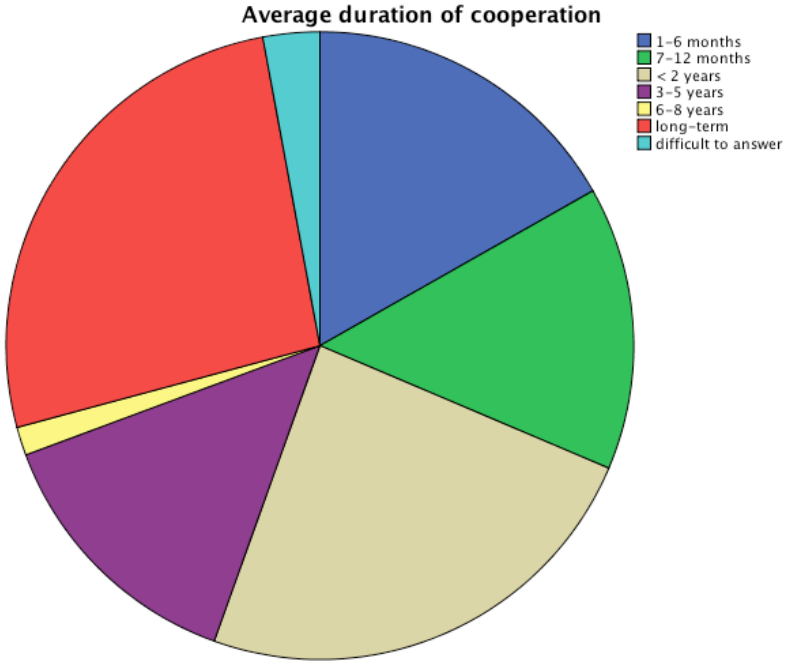
We found that in Russia cooperation in innovative activities often takes the form of partnership or functional cooperation and subcontracting (fig. 4). Therefore, most of the cooperative relationships fall into one or another category from the middle of the relationship continuity between the market and the hierarchy (Williamson, 1992).

Figure 4. The form of cooperation of Russian companies



The average duration of innovation-related cooperation in case of 66% sample firms lasted more than a year and only in case of 17% respondents - less than 6 months (fig. 5). In 69% of the cases cooperation was regarded as strategically important. In more than 90% of cases cooperation was reinforced by signing a contract or written agreement and more than 35% of the companies stated that they always sign a contract in cooperation with external partners on innovation activities, while only 9% sign this type of agreements rarely.

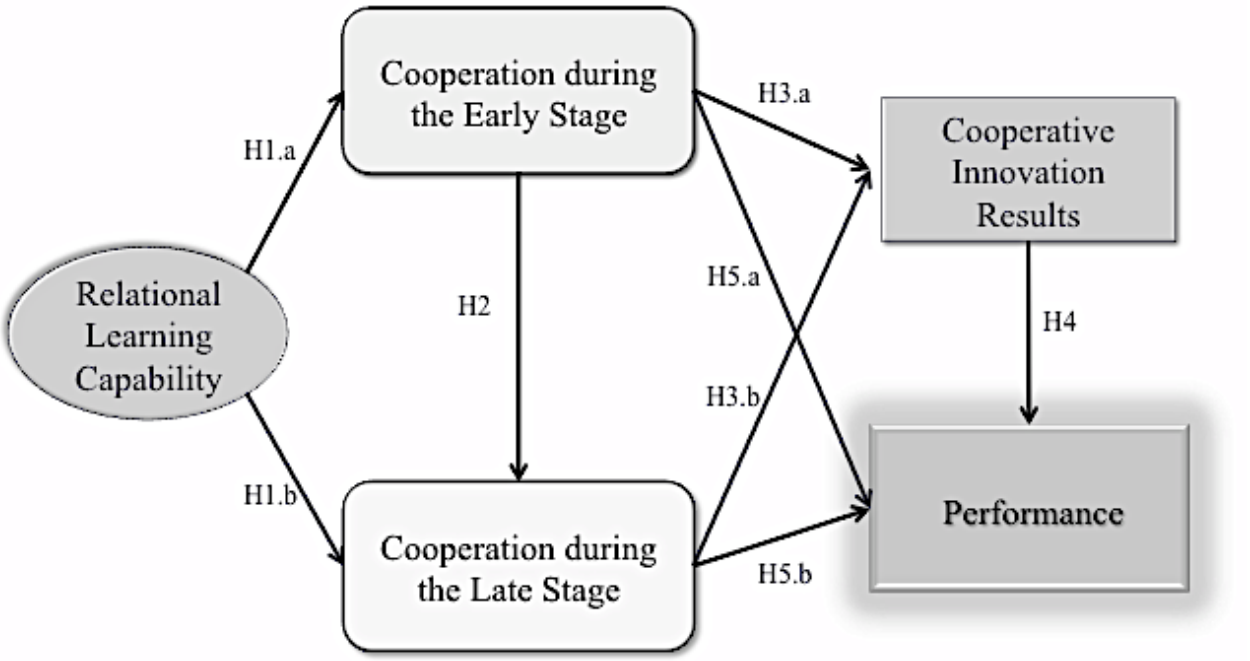
Figure 5. Average duration of the cooperation in innovation in the data sample



3.2.2. Model

In the next part we test our conceptual model (see Fig. 6).

Figure 6. The conceptual model



All constructs used in our model were measured on the base of existing scales and then checked for reliability, validity and unidimensionality. The cooperation at the stages of innovation process was operationalized by measuring the regularity of cooperation with heterogeneous actors on seven stages of innovation activities (following CIS 2010 methodology). We relied on measuring the managers' perception of the company's relational experience and the evaluation of performance changes in last 3 years in comparison with the objectives set. Company's performance is a higher-order construct with four dimensions: growth, profitability, customer values and adaptability. The results of cooperation are represented by the assessment of the impact of cooperation on the intermediate innovative results.

All variables were measured by multiple-item, five-point Likert-type scales, ranging from 1 ("strongly disagree" or "never") to 5 ("strongly agree" or "on regular basis"), except for the performance variable, which was measured from -2 ("became significantly worse") to +2 ("significantly improved").

At first, we ran EFA to ensure the unidimensionality of constructs, computed Cronbach's alpha (for all constructs – greater than 0,800) to measure reliability and then conducted CFA to assess both the construct validity and model fit (using IBM SPSS21 and AMOS21). In order to avoid minimum sample size to parameter ratio in our model we measured the performance construct by loading it on the calculated means of four dimensions. We ensured the composite reliability, convergent and discriminant validity of constructs by refining the initial measurement scales. We run multiple iterations of CFA to purify our measurement scales and reduced a number of items to optimize the model fit. Each of the items appropriately loaded on the constructs with acceptable significant factor loadings in the range from 0,500 with 5% level of significance. Chronbach's Alpha for all constructs were greater than 0,820, CR greater then 0,846. Maximum correlation between constructs was 0,720. Fornell &Larcker's (1981) criterion was applied to

check for discriminate validity: all AVEs were greater than the squared correlations between all constructs (for more detailed information please refer to table 2 and table 3). The means, standard deviations, AVEs and squared correlations are represented in the table 2. Cronbach's Alpha, CR, AVE and factor loadings – in table 3.

Table 2. The results of CFA

Constructs	Mean	S.D.	1	2	3	4	5
1. Relational Learning Capability	3.506	0.950	0.713	0.144	0.110	0.518	0.034
2. Regularity of cooperation (early stage)	2.604	1.055	0.379	0.67	0.421	0.168	0.051
3. Regularity of cooperation (late stage)	2.633	1.092	0.331	0.649	0.663	0.140	0.107
4. Cooperative innovation results	3.590	0.844	0.72	0.41	0.374	0.595	0.098
5. Performance	0.657	0.692	0.184	0.225	0.327	0.313	0,718

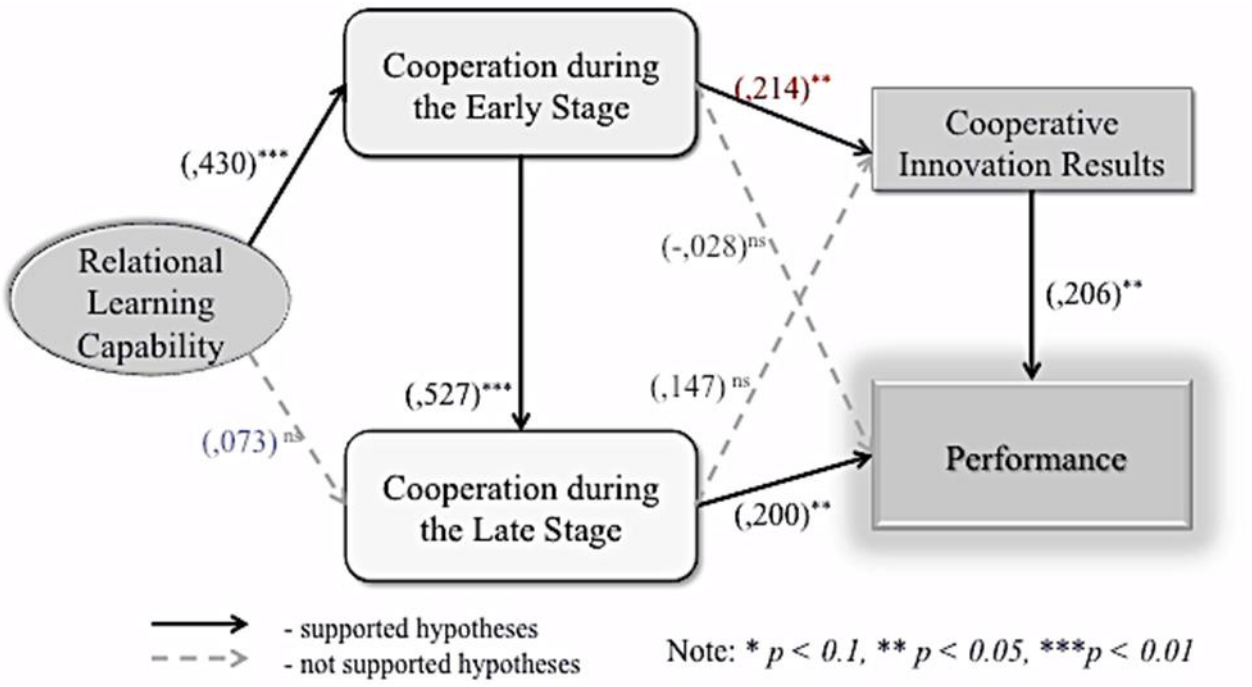
Note: Below the diagonal - correlations between the constructs, above the diagonal - squared correlations, diagonal - AVEs.

However, the first empirical test of the conceptual model (fig. 7) indicated a rather poor model fit. The following indicators were within the acceptable range: CMIN/DF=1,810; TLI=0,917; CFI=0,931; however, some did not meet the minimum requirements: GFI=0,869; RMSEA=0,072 (PCLOSE=0,010). Based on the information from the modification indices section we added a direct connection between relational learning capability and cooperative innovation results (fig. 7), which was not initially hypothesized in our conceptual model. However, there can be a certain theoretical justification for this empirical result. Indeed, development of relational learning capability should necessarily improve cooperative innovation results, even in case when firm does cooperate not only on innovation - thus a direct link between the constructs can be added. Our final model after the abovementioned modification indicated a sufficient model fit: CMIN/DF=1,329; GFI=0,904; TLI=0,971; CFI=0,976; RMSEA=0,046 (PCLOSE=0,619).

Table 3. Construct reliability measures overview

Construct	Cronbach's Alpha	Construct reliability	AVE
1. Relational Learning Capability	0,915	0,881	0,713
2. Regularity of cooperation (early stage)	0,854	0,859	0,670
3. Regularity of cooperation (late stage)	0,849	0,854	0,663
4. Cooperative innovation results	0,846	0,854	0,595
5. Performance:	0,941	0,962	0,718
Growth	0,820	0,846	0,733
Performance	0,910	0,885	0,719
Customer values	0,872	0,885	0,793
Adaptability	0,847	0,851	0,658

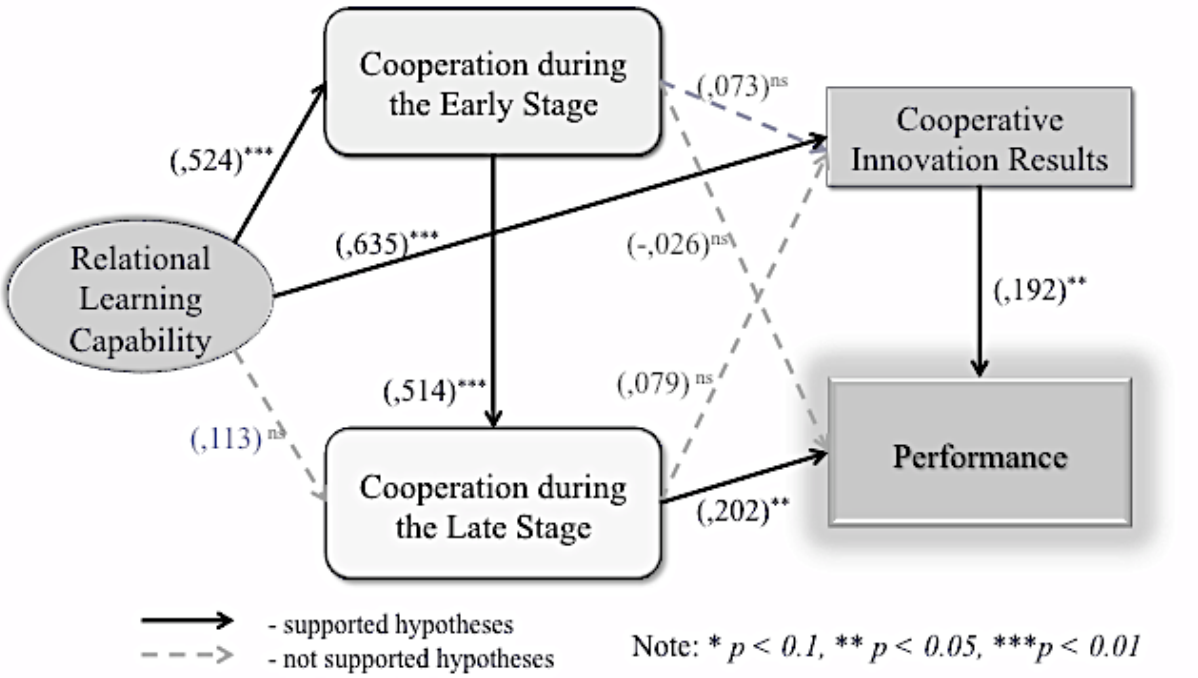
Figure 7. The results of the testing of preliminary model



4. Key Findings

The key goal of our research was to examine the effect of cooperation at different stages of innovation process on cooperative innovation results and company's performance, along with the the analysis of the role of relational learning capability in establishing cooperative innovative partnerships. For this purpose we tested a developed conceptual model. Fig. 8 represents the final conceptual model and the path estimators.

Figure 8. The final conceptual model and path estimation



Note: * $p < 0.1$, ** $p < 0.05$, ***$p < 0.01$

The hypotheses H1a, H2, H4 and H5b were supported (table 4). We found the proof that there is, indeed, a connection between the cooperation at the early and late stages of innovation process. Our analysis suggests that relational learning capability is the driver for innovation cooperation at the early stage of innovation process and that relational learning capability positively affects the results of cooperative innovation. We also found evidence that company's performance is influenced by the cooperation during the late stage of innovation process and the results of cooperative innovation. However, we couldn't find evidence to support the hypotheses H1b, H3a&b and H5a. It means that we didn't find the links between the cooperation during the late stage and relational learning capability or the cooperative innovation results. Our analysis also didn't indicate the connection between cooperation at the early stage and the cooperative innovation results and company's performance. As a matter of fact, we didn't expect the absence of the relations between the cooperation in both stages and the cooperative innovation results. Possible explanations of this absence are given in the next section.

Table 4. The results of path testing

		Estimate	P
Cooperation at the early stage	← Relational learning capability	,524	***
Cooperation at the late stage	← Relational learning capability	,113	,234
Cooperation at the early stage	← Cooperation at the early stage	,514	***
Results of cooperative innovation	← Cooperation at the early stage	,073	,320
Results of cooperative innovation	← Cooperation at the late stage	,079	,354
Results of cooperative innovation	← Relational learning capability	,635	***
Performance	← Results of cooperative innovation	,192	**
Performance	← Cooperation at the late stage	,202	**
Performance	← Cooperation at the early stage	-,026	,736

Note: *** indicate 0,01% level of confidence, ** - 0.05%.

5. Discussion

Our analysis was in line with the prior literature on the stages of innovation process (Hempelmann &Engelen, 2014; Laursen &Salter, 2014) and showed that all phases of cooperation fall into two main stages. The first (early) stage comprises idea creation, preliminary development and project planning, preliminary assessment of the project; the second (late) one - testing the prototype or market testing, launching the product and after sale services.

The cooperation during the early stage of innovation process is driven by relational learning capability. And the more company focuses on this capability the more it tends to increase regularity of cooperation. It's also highly logical that if company focuses more attention on learning from previous experience its cooperation with external parties becomes more effective, explaining the link between relational experience and the cooperative innovation results. In fact, we can say that the results of cooperation in innovation depend primarily on the relational experience, and not only on the regularity of cooperation.

The cooperation during the late stage of innovation process may be perceived as having a different nature. Partners do not directly share the risks of invention and idea development, but rather bringing the product/service to the market. The types of risks and barriers of cooperation at this stage strongly differ from the early stage of the innovation process. The success however is not just an idea creation, but its successful market launch, resulting - as also confirmed by our empirical results - by a direct increase in firm's performance.

Cooperation at the early stage makes companies more assured in their partners and their contribution to the innovation process, which (and not their relational learning capability) drives them to continue to involve external parties also in the later stage of innovation process. In other words, openness during the early stage is also positively associated with an open approach when commercializing the innovation.

We also can presume that relational learning capability may not influence the cooperation during the late stage of innovation process if companies cooperate more in the earlier stage, thus being more experienced and assured in this type of cooperation and not the cooperation in production and commercialization. This result highlights the differences between this major stages of the innovation process. Probably, learning can really help rather at the early stage, where cooperation can be more longterm and strategically important for innovation creation. The early stage of innovation process implies greater interdependence between cooperating actors and greater need for building long-lasting relationship as it is usually characterized by long research cycles and building on from the roots of the company. At the later stage the focus can be shifted and cooperation can have a more transactional nature. This optimization of partnerships, probably a more opportunistic approach can rather pay off instead of learning from how to improve cooperation with one partner. This result however can be definitely recommended for further investigation and future research.

Our main contributions to the literature on cooperation in innovation process are the following. Firstly, relational learning capability triggers the cooperation at the early stage of innovation process that has later an indirect impact on performance through influencing cooperation at the late innovation stage. Secondly, if company focuses more attention on learning from previous experience the cooperation becomes more effective and does also influence performance outcomes. These results do indicate two paths to influence firm performance: by learning more from existing relationships, and by building a system of cooperation at different stages of innovation process.

The practical implications of our results suggest that companies should investigate their patterns of cooperation to increase the effect of cooperation in innovation process on the performance, as well as on the results obtained from jointly developed innovation. The proper analysis of innovative relationships shows that companies understand the importance of cooperation and might cooperate more. Paying attention to innovation cooperation and learning from existing relationships has impact on both cooperative results (directly) and company performance (indirectly). Apart from focusing on the relational experience companies should also improve interrelations between the stages of innovation process to increase the returns from their cooperation.

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